International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 04 | Apr 2020 www.irjet.net p-ISSN: 2395-0072

# Automatic Car Insurance using Image Analysis

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**Abstract -** *The vehicle damage detection task is one of the most vital activities in the vehicle insurance and vehicle rental industries. The systems of these kinds are used to identify the damage of a vehicle once an accident happens by the driver and also by the insurance company to detect and determine a suitable amount as per damage and vehicle rental companies to inform about the damage of a vehicle to the customer. The core technique here is object recognition. So once vehicle body damages, the driver does not have to wait until the insurance company calculates the appraisal, he/she himself can get a brief idea as to how much will it cost to recover the damage. Once the image is uploaded, the system will process the image and identify the dent, scratches, shattered glasses, etc. Next, it is classified into the various severity classes by considering the features of the vehicle like the make, model and the year of manufacture. Later, the severity generated as per damage image is mapped with the cost rules, which are constructed based on various properties of the vehicle such as the make, model and the year of manufacture. In the end, the customer gets notified with a level of damage severity and an average cost from which the damage can be recovered. So to solve this problem, we are applying the concept of image analysis, which is used to gain more accurate damage result of any exterior part of the car and provide suitable liability.*

***Key Words***: Body damage detection, cost prediction, image analysis, object recognition.

## 1. INTRODUCTION

At present, in the car insurance industry, a lot of money is wasted because of claims leakage. Claims leakage is simply defined as the difference amount between the actual claim payment made and the amount that should have been paid. Validation and visual inspection have been used to reduce such effects. There have been efforts by too few start-ups to reduce the claim processing time. For the classification of car damage types we made the use of Convolutional Neural Network (CNN) based methods. Specifically, we are considering common damage types such as the glass shatter, door dent, bumper dent, tail lamp broken, head lamp broken, smash and scratch. As there is no publicly available dataset for car damage classification, therefore we also created our own dataset by collecting multiple images of different types from the internet and annotating them manually. The classification task is challenging due to factors such as barely visible damages and large inter-class similarity. Experimental results validate the effectiveness of our future architecture of insurance solutions.

## 2. LITERATURE SURVEY

A. Deep learning based car damage classification- Kalpesh Patil, Mandar Kulkarni and Shirish Karande (2017) [4] have employed CNN based methods for classification of car damage types. Specifically they considered common damaged types such as glass shatter, bumper and door dent, head lamp and tail lamp broken, smashes and various scratches. They have collected data over the web because it is not possible to collect the data personally. In this method the classification task was challenging because of factors such as barely visible damages and large inter-class similarity. They experimented with multiple deep learning based techniques such as training CNNs from random initialization, Convolution Auto encoder based pre-training followed by supervised fine tuning and transfer learning. They also observed that the transfer learning performed the best. They also concluded that only car specific features may not be effective for damage classification.

B. Image based automatic vehicle damage detection- Srimal Jayewardene's (2013) [9] approach requires 3D computer aided design (CAD) modes of the considered vehicle to identify how it would look if it were undamaged. But they were not able to obtain such 3D models so they have used advanced applications like convolutional neural networks in computer vision. In convnets have proven their power in object recognition tasks for which image large scale visual recognition challenge (ILSVRC). Automatically detecting the damage of the vehicle using photographs clicked at the accident site is extremely functional as it can greatly decrease the rate of processing insurance claims, and it will also provide greater conveniences for customers who are making the best use of this functionality. An ideal scenario would be where the client can upload some photographs of the damaged car taken from a smartphone and have the damage assessment and insurance claim processing done automatically by the system. However, such a solution remains a challenging task due to a number of factors [9]. For a start, the scene of the accident is typically an unknown and uncontrolled outdoor environment with a lot of factors beyond our control including scene illumination and the presence of surrounding objects which are not known [9]. And as vehicles have very reflective metallic bodies the photographs taken in such an uncontrolled environment can be expected to have a certain amount of inter object

reflection [9]. Therefore, the application of standard computer vision techniques in this context is a very challenging task [9].

C. Drowsiness warning system using artificial intelligence- The authors Sharma N. & Banga, V K. (2010) [12] have discussed the various artificial detection methods for detecting driver's drowsiness processing technique. This system is based on analysis of facial images for warning the driver of drowsiness or in attention to prevent traffic accidents [10]. They have used computer vision approaches to detection of fatigue and have focused on the analysis of blinks and head movements. The detection mechanism into vehicles might help in preventing many accidents on a daily basis.

D. Applying image analysis to auto insurance Triage: A novel application- The authors Ying Li and Chitra Dorai (2007) [13] have used a simple approach for analysing minor damages on the car and claim the process efficiently as there is no need for training the model. The architecture of insurance applies advanced image analysis and pattern recognition technologies to automatically identify and characterize vehicle damage. To demonstrate its potential, they have built a prototype system which identifies externally visible damage by comparing the before- and after-accident images. All the required test images were taken under an extremely controlled capturing environment [13]. Since their goal of developing the prototype system is to quickly investigate the feasibility of applying image analysis technology to industries that desire (semi-)automated assessment, it was thus not their interest to develop complicated algorithms that may work perfectly in all real-world situations without first knowing whether such an application is desired [13].

E. On-road vehicle detection: A review- The authors Zeheng Sun, G. Bebis and R. Miller (2006) [14] presented a review of recent vision-based on-road vehicle detection systems. Their focus was on systems where the camera was mounted on the vehicle rather than being fixed such as in driveway/traffic monitoring systems. Initially, they discussed the issues of on-road vehicle detection using optical sensors followed by a short review of intelligent vehicle research all over the world. Later, they discussed about the passive and active sensors for vision based vehicle detection. Methods aiming to consider the location of vehicles in an image quickly and to verify that the considered locations were reviewed later or not [14]. Integrating detection with tracking was also reviewed to illustrate the benefits of exploiting temporal continuity for vehicle detection [14].

## 3. SYSTEM DESIGN

In this system, CNN Model is used to implement automatic car insurance using image analysis and provide an optimistic cost to the user. Suppose some damage occurs to the car, so to claim the insurance and to know the estimated cost of the repair, the policyholder will access the website. Initially the policyholder will have to register on the website, then fill in the required information of the customer and car and then upload the image. By using the CNN model the cost will be predicted and it will be displayed on the screen. We have used the Django framework to design our user interface and integrate our car damage prediction model to the system.

A. Model

Model is generated by the training dataset of all categories of car damage data based on different classes. Model is designed to predict the approximate cost of a damaged car. Model is the core component of this system as good as the model is trained, the better the results should be for estimating optimistic cost and providing the required amount to be paid. But in case of severity of damage is high i.e. if a model prediction results in smash or destroys. For such cases the assessment team from the company or car insurance provider is sent for assessing the damaged car condition. Model training requires large amounts of data which indirectly affect the accuracy. The larger the trained data, better the result will be achieved. Model is trained using Convolutional Neural Network (CNN) which is a class of deep learning.

B. Dataset

Dataset is connected from github which contains all kinds of damaged car images. Then we labeled the dataset images based on classes such as scratch, dent, smash, glass shatter, etc. As training the CNN models requires large amounts of dataset, which won't be possible or feasible to generate large dataset so we have augmented available dataset.

C. Augmented Dataset

It is the data which is generated after applying certain operations on image those operations are rotate, shift, flip etc.

Table -1: Augmented Dataset

| Classes | No. of Dataset | No. of Train Dataset | No. of Test Dataset |
|---|---|---|---|
| Scratch | 280 | 224 | 56 |
| Dent | 300 | 240 | 60 |
| Side_dent | 285 | 228 | 57 |
| Shuttered | 310 | 248 | 62 |
| Glass_shattered | 300 | 240 | 60 |
| Lamp_Broken | 280 | 224 | 56 |
| Mirror_broken | 280 | 224 | 56 |

| | | | |
|---|---|---|---|
| Bumper_dent | 300 | 240 | 60 |
| Destroy | 285 | 228 | 57 |
| Not_damage | 295 | 236 | 59 |

D. Training Process

In training the model we have to preprocess the image before training it. The preprocessed image size (150, 150, 3) i.e. (width, height and channel) respectively. We have used (RGB) scale images to train models then these images are turned into CNN models.

### 3.1 BLOCK DIAGRAM

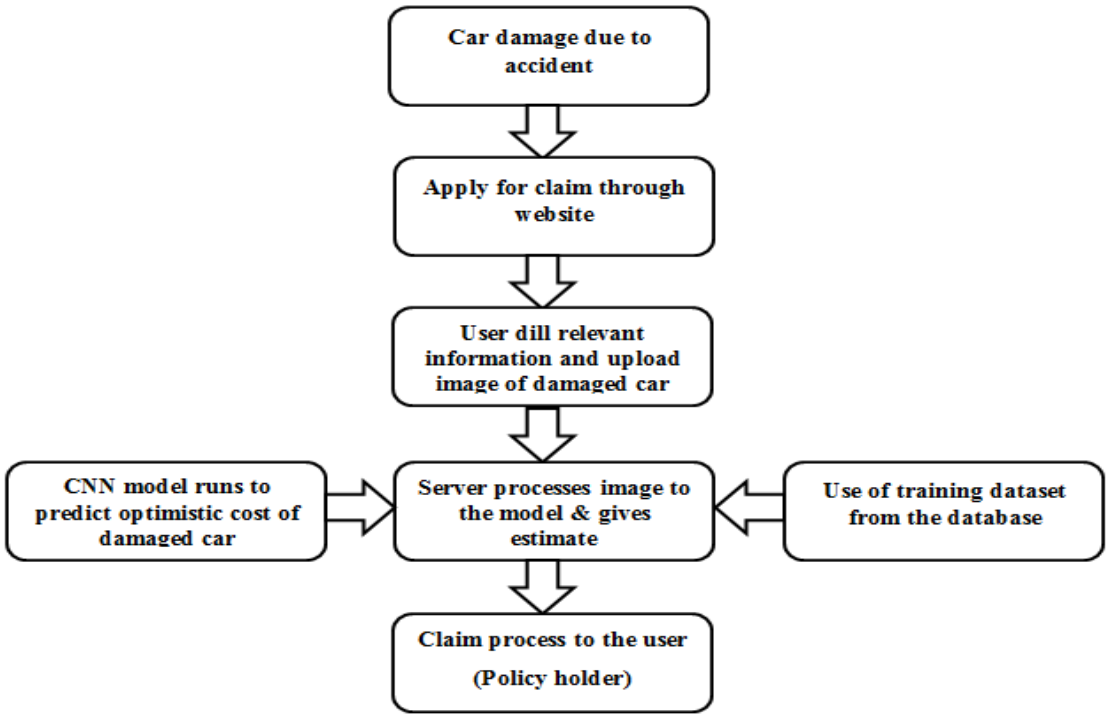


**Fig -1**: Automatic Vehicle Damage Assessment and Cost Estimation System

### 3.2 SNAPSHOTS

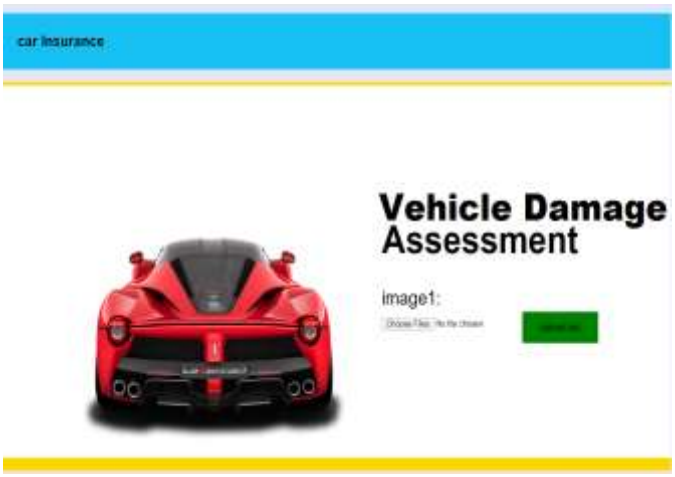


**Fig -2**: File uploading page


**Fig -3**: Result displaying the damage occurred


**Fig -4**: Result displaying amount to be paid (1)


**Fig -5**: Result displaying amount to be paid (2)

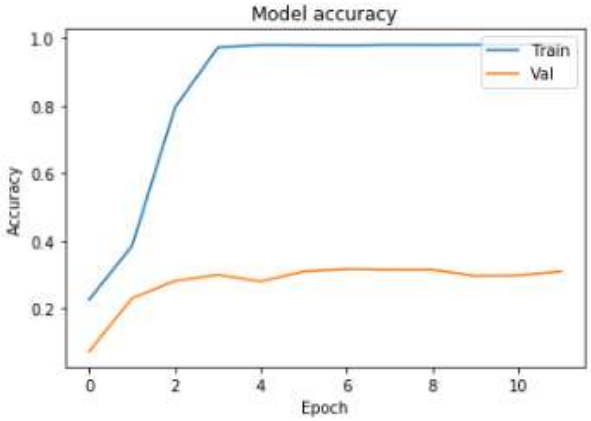


**Fig -6**: Model Accuracy

The accuracy is defined as how good your machine learning model is at predicting a correct class for a given observation.

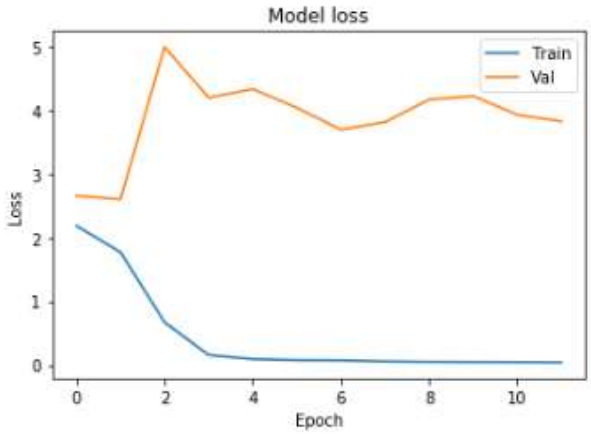


**Fig -7**: Model Loss

The term loss is simply defined as a number indicating how bad the models prediction was on a certain example.

## 4. CONCLUSIONS

Image analysis methods extract information from an image by using semi-automatic or automatic techniques termed: image understanding, image description, scene analysis, pattern recognition, computer/machine vision etc). Image analysis is different from the various other types of image processing methods, such as the restoration or enhancement in that the end result of image analysis procedures is a numerical output rather than an image or some pictorial output. By analyzing different techniques in literature review we conclude different technologies used to provide solutions for insurance companies, such as Srimal Jayawardena uses 3D model of car and other latest papers uses CNN model and categories different types of damages which provide efficient machine learning concepts to predict cost evaluation for damage.

## ACKNOWLEDGMENT

It is our privilege to express our respect and very sincerest regards to our supervisor **Prof. Rupali Nikhare** for the valuable inputs, able guidance, encouragement, whole-hearted cooperation and constructive criticism throughout the duration of this work. We also thank our project coordinator, **Prof. Gayatri Hegde** for her guidance on the planning and implementation of our project. We deeply express our sincere thanks to our Head of the Department **Satishkumar Varma** and our Principal **Dr. Sandeep M. Joshi** for encouraging, motivating and allowing us to present this work at this scale.

## REFERENCES

[1] Sanket Doshi. "Traffic Sign Detection using Convolutional Neural Network." 2019.
[2] de Deijn, Jeffrey. "Automatic Car Damage Recognition using Convolutional Neural Networks." (2018).
[3] Manju, More E. "RESEARCH PAPER ON INTELLIGENT FARMING FOR FARMERS USING CONTROL SYSTEM IN IOT." International Journal of Advanced Research in Computer Science 9.3 (2018): 181.
[4] Patil, Kalpesh, et al. "Deep learning based car damage classification." 2017 16th IEEE International Conference on Machine Learning and Applications (ICMLA). IEEE, 2017.
[5] Harshani, WA Rukshala and Kaneeka Vidanage. "Image processing based severity and cost prediction of damages in the vehicle body: A computational intelligence approach." 2017 National Information Technology Conference (NITC). IEEE, 2017.
[6] Kinsella, Graham. Car damage monitoring system: Final project report analysis and design. Diss. Dublin, National College of Ireland, 2017.
[7] Huang, Gao, et al. "Densely connected convolutional networks." Proceedings of the IEEE conference on computer vision and pattern recognition. 2017.
[8] He, Kaiming, et al. "Deep residual learning for image recognition." Proceedings of the IEEE conference on computer vision and pattern recognition. 2016.
[9] Jayawardena, Srimal. "Image based automatic vehicle damage detection." (2013).
[10] Image Based Automatic Vehicle Damage Detection, Marcus Hutter, Stephen Gould, Richard Hartley, Hongdong Li, 2013.
[11] Ting, Hua-Nong, ed. 5th Kuala Lumpur International Conference on Biomedical Engineering 2011: BIOMED 2011, 20-23 June 2011, Kuala Lumpur, Malaysia. Vol. 35. Springer Science & Business Media, 2011.
[12] Sharma, Nidhi, and V. K. Banga. "Drowsiness warning system using artificial intelligence." World Academy of Science, Engineering and Technology 4.7 (2010): 1771-1773.
[13] Li, Ying, and Chitra Dorai. "Applying Image Analysis to Auto Insurance Triage: A Novel Application." 2007 IEEE 9th Workshop on Multimedia Signal Processing. IEEE, 2007.
[14] Sun, Zehang, George Bebis, and Ronald Miller. "On-road vehicle detection: A review." IEEE transactions on pattern analysis and machine intelligence 28.5 (2006): 694-711.
[15] Traffic Sign Detection using Convolutional Neural Network.
[16] P. Strumillo. "Segmentation.pdf".